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Conceptual Design Report for the Staging, Storage, Stabilization, and Treatment Facility



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ABSTRACT

This conceptual design for the Staging, Storage, Stabilization, and Treatment Facility (SSSTF) provides waste treatment and interface support capabilities for the Idaho National Engineering and Environmental Laboratory (INEEL) CERCLA disposal facility (ICDF). The SSSTF will provide the capabilities to receive waste from INEEL Waste Area Group (WAG) 3 and other INEEL WAGs and direct the waste either to direct disposal in the ICDF or to segregation and treatment processes within the SSSTF. The SSSTF will serve as the waste acceptance and inventory control portal for the ICDF. Three waste treatment processes and a capability to segregate low volume anomalous are included in the design concept. Waste treatment processes included in this concept include cement-based stabilization (grouting), chemical neutralization, and chemical oxidation. The SSSTF will also provide the capability to receive and store well development and purge water generated as a result of INEEL CERCLA remedial actions. Infrastructure supporting staging of waste in preparation for treatment, waste size reduction and blending, equipment decontamination, and internal facility waste transportation are also included in this concept. The configuration and overall design will plan for future expansion capabilities and enhance the overall operations of the disposal activities of the ICDF.

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ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
ASCE	American Society of Civil Engineers
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CPP	Chemical Processing Plant
CWID	CERCLA Waste Inventory Database
DDC	direct digital control
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy Idaho Operations Office
EDF	Engineering Design File
EPA	Environmental Protection Agency
FFA/CO	Federal Facility Agreement and Consent Order
HEPA	high-efficiency particulate air (filter)
HVAC	heating, ventilation, and air conditioning
ICDF	INEEL CERCLA disposal facility
INEEL	Idaho National Engineering and Environmental Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
LDR	Land Disposal Restriction
MCP	Management Control Procedure
NFPA	National Fire Protection Association
OU	operable unit
PC	personal computer
QA	quality assurance
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action

RI/BRA	Remedial Investigation/Baseline Risk Assessment
ROD	Record of Decision
SOW	scope of work
SSSTF	Staging, Storage, Stabilization and Treatment Facility
T&FR	technical and functional requirements
TSCA	Toxic Substances Control Act
UBC	Uniform Building Code
UPC	Uniform Plumbing Code
UPS	uninterruptible power supply
US	United States
WAC	Waste Acceptance Criteria
WAG	Waste Area Group

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1. INTRODUCTION

1.1 Background

The Idaho National Engineering and Environmental Laboratory (INEEL), including the Idaho Nuclear Technology and Engineering Center (INTEC), was placed on the National Priorities List in November 1989. A Federal Facility Agreement and Consent Order (FFA/CO) was negotiated with the Environmental Protection Agency (EPA) and Idaho Department of Health and Welfare to direct cleanup activities at the INEEL.

A comprehensive study, or remedial investigation/baseline risk assessment (RI/BRA), was conducted to evaluate the nature and extent of soil and groundwater contamination at the INTEC. The results of the RI/BRA activities indicate that soil at certain release sites and groundwater contamination, pose a potential risk above acceptable levels to human health and the environment.

Therefore, the U.S. Department of Energy Idaho Operations Office (DOE-ID) authorized a remedial design/remedial action (RD/RA) for the INTEC resulting in the Waste Area Group 3, Operable Unit 3-13, Record of Decision (ROD) (DOE-ID, 1999).

According to the ROD, contaminated surface soils will be removed and disposed in the INEEL CERCLA Disposal Facility (ICDF). The ICDF will be an onsite facility for treatment and disposal of low-level, low-level mixed, hazardous, and some Toxic Substances Control Act (TSCA) wastes. The ICDF includes necessary subsystems and support facilities to provide a complete waste disposal system. The major components of the ICDF are the disposal cells and the Staging, Storage, Stabilization and Treatment Facility (SSSTF).

Each disposal cell will be an engineered landfill meeting Resource Conservation and Recovery Act (RCRA) Subtitle C, Idaho Hazardous Waste Management Act, and polychlorinated biphenyl landfill design and construction requirements. The landfill complex will be located southwest of INTEC and adjacent to the existing percolation ponds.

The SSSTF will be the center for all waste handling and processing for the ICDF. The facility will provide centralized receiving, inspection, and treatment necessary to stage, store, size and stabilize incoming waste from various INEEL Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remediation sites prior to final disposition. Wastes meeting the ICDF Waste Acceptance Criteria (WAC) will be transported to the ICDF, wastes that do not meet the ICDF WAC will be packaged for shipment offsite or transported to appropriate onsite disposal. The facility will consist of a staging/storage building, contained staging and storage areas, administrative offices, and associated treatment equipment. Operations at the facility will include chemical/physical treatment to prepare ICDF wastes to meet agency-approved WAC and RCRA land disposal restrictions (LDRs).

1.2 Report Overview

This conceptual design consists of the following physical items:

- An administrative building with space to support operational personnel, administrative personnel, support personnel, and environmental, safety, health and quality personnel
- Waste storage that includes an enclosed building and contained outdoor storage/staging pads
- Water storage prior to discharge to the ICDF evaporation pond
- A staging area for off-loading full waste containers and on-loading empty waste containers
- A process building containing a waste sizing and stabilization process
- A treatment process for organically-contaminated soils
- Supporting utilities, fencing, road modifications, and other site modifications necessary to support the project.

Included in this report are the design criterion used, alternatives considered, a description of process and facility designs, discussion of codes and standards, and estimated capital and life-cycle costs.

A preliminary plan to complete the activities leading to 30% design completion is defined in Appendix A. This plan defines the scope of the work to be accomplished, the deliverables needed to support design, and the schedule for completion of these tasks.

2. CONCEPTUAL DESIGN CRITERIA AND KEY ASSUMPTIONS

2.1 Functional and Performance Requirements

Baseline requirements for the SSSTF are defined in the technical and functional requirements (T&FR) document for the facility. The T&FR document was developed in accordance with guidelines defined in the INEEL Management Control Procedure (MCP)-3572, System Design Descriptions. The requirements define the functional, design, and operational criteria utilized for the design of the facility. The T&FR document is included in this report as Appendix B.

2.2 Waste Inventory

An accurate accounting of the waste to be processed through the SSSTF for disposal is not available at this time. A preliminary estimate based on engineering judgment was used to support the Conceptual Design activity. The initial inventory of INEEL CERCLA waste to be processed through the SSSTF/ICDF Complex is defined in Appendix C of the Remedial Investigation/Feasibility Study. The INEEL CERCLA Waste Inventory Database (CWID) is being created based on the initial inventory. The CWID database will be the basis of Title Design work, and therefore will be reviewed and approved by the agencies.

2.3 Environmental Requirements

The SSSTF will be designed and operated in accordance with those applicable or relevant and appropriate requirements (ARARs) and with appropriate best management practices. The ARARs that have been identified to apply to the SSSTF are identified in the SSSTF T&FR document. The T&FR document is included in this report as Appendix B. It should be noted that additions or deletions to this list may be necessary depending on the final design of the facility and accompanying units.

2.4 Key Assumptions

The scope of the work to develop the SSSTF is defined in the final Record of Decision for Operable Unit (OU) 3-13, and the Remedial Design/Remedial Action Scope of Work for Waste Area Group (WAG) 3. Assumptions were made to define limiting factors and conditions needed to support the SSSTF conceptual design activities. Requirements were then defined to implement the functionality imposed by the assumptions. These assumptions were documented in Section 1.6 of the SSSTF T&FR document which is included in Appendix B of this report.

3. ALTERNATIVES CONSIDERED

When developing the concept for treatment processes to be included in the SSSTF design, alternatives were considered that were expected to address the chemical contaminants included in the initial waste inventory and the organic constituents summarized in Table 3-1. Initial evaluation of the likely contaminants indicated that a combination of cement-based stabilization, neutralization, and chemical oxidation are viable treatment candidates for processing these wastes. Cement-based stabilization is expected to address RCRA metals, neutralization is expected to address acid waste, and chemical oxidation is expected to address ignitable/organic contaminants.

Because considerable uncertainty exists in the concentrations of hazardous chemical constituents of the wastes to be processed in the SSSTF, selecting viable treatment processes is speculative. There is at least a reasonable probability that much of the waste will have concentrations of hazardous constituents below the concentration-based limits, and therefore treatment would not be required. Concentration-based limits for the contaminants from the CERCLA waste inventory are identified in Table 3-1.

Cement-based stabilization for RCRA metals has been extensively tested on various INEEL wastes and proven to treat them to LDR limits. There is a high probability that this technology will be suitable for use in the SSSTF. Therefore cement-based stabilization is considered in this conceptual design as a process treatment.

Neutralization of wastes is a well-developed process and not expected to generate any significant design considerations in the SSSTF design. There is a high probability that the wastes identified as being acidic will have been neutralized naturally by contact with the basic soils of the INEEL. Regardless, neutralization is considered in this conceptual design as a process treatment.

Based on guidance from the U.S. EPA, and the U.S. DOE Idaho Operations Office (DOE-ID), it has been decided to not pursue thermal incineration.

Alternate approaches for treatment of ignitable and organic contaminated wastes, were also identified. The following categories of technologies were identified:

- Chemical Oxidation: This might include chemical or electrolytic oxidation using: (1) hypochlorite, (2) chlorine, (3) chlorine dioxide, (4) ozone or ultra violet-assisted ozonation, (5) peroxides, (6) persulfates, (7) perchlorates, and (8) permanganates.
- Chemical Extraction: This might include liquid phase solvent extraction or vapor phase solvent extraction.
- Biological Destruction: This might include either aerobic or anaerobic bioprocessing.

Chemical oxidation appears to be the most viable method for treating ignitable and organic-contaminated waste. However, based on significant uncertainties in the inventory and character of wastes to be treated in the SSSTF, an oxidant could not be selected and included as a part of this conceptual design. Two major issues make chemical oxidation processes more difficult to conceptualize. The first is chemical oxidants are significantly more selective to the compounds that they can effectively oxidize and often incomplete oxidation products are formed, which can also be hazardous. Also, nontarget organic constituents in the wasteform can significantly influence oxidation of the target constituent. The second issue is that chemical oxidation process equipment varies radically depending on the oxidant used. Gas-phase oxidation processes utilize much different process equipment than liquid-phase or solid-phase processes.

Table 3-1. Anticipated hazardous waste constituents from WAG-CERCLA wastes to be processed through the SSSTF.

Chemical Constituent	CAS #	Final EPA Hazardous Waste Number	Treatability Standards
Acetone	67-64-1	F003	160 mg/kg
Benzene	71-43-2	F005	10 mg/kg
Carbon disulfide	75-15-0	F005	4.8 mg/L TCLP
Carbon tetrachloride	56-23-5	F001 F002	6 mg/kg
Cyclohexane	110-82-7	Not available	Not available
Cyclohexanone	108-94-1	F003	0.75 mg/L TCLP
Ethyl acetate	141-78-6	F003	33 mg/kg
Hydrogen fluoride (hydrofluoric acid)	7664-39-3	U134	Neutralization
Methanol	67-56-1	F003	0.75 mg/L TCLP
Methyl isobutyl ketone (Hexone or 4-Methyl- 2-pentanone)	108-10-1	F003	33 mg/kg
Pyridine	110-86-1	F005	16 mg/kg
Tetrachloroethylene	127-18-4	F002	6 mg/kg
Toluene	108-88-3	F005	10 mg/kg
1,1,1-Trichloroethane	71-55-6	F001 F002	6 mg/kg
Trichloroethylene	79-01-6	F001 F002	6 mg/kg
Xylene	1330-20-7	F003	30 mg/kg

A Regulatory Analysis and Reassessment of U.S. EPA Listed Hazardous Waste Numbers or Applicability to the INTEC Liquid Waste System. INEEL/EXT-98-01213 Rev. 1, February 1999

Organic technologies, appropriate oxidant(s), and process treatment train(s) are currently being investigated through Engineering Design File (EDF) format for the 30% design. Waste treatment feasibility studies supporting stabilization and neutralization will also be conducted as part of the 30% design. The following tasks, based on EPA guidance for performing treatability studies under CERCLA, will be performed:

- Refine wasteform inventory and characterization data
- Identify candidate treatment technologies/treatment trains
- Establish data quality objectives
- Identify a qualified contractor and select a contracting mechanism
- Define scope of work
- Develop work plan
- Prepare sampling and analysis plan, health and safety plan, and community relations plan
- Conduct treatability study(ies)
- Wasteform and residuals management
- Data analysis and interpretation
- Results report.

A matrix will be produced and an evaluation logic presented identifying the associated attributes and weights.

The purge water is to be disposed in the ICDF evaporation ponds, but sampling and drilling activities of the monitoring wells are scheduled to occur prior to the availability of the ICDF evaporation ponds. The manner in which purge water will be managed during the interim period is being evaluated as an independent issue. The results of that evaluation will be documented in an engineering design file, and completed prior to well installation.

Water storage is minimally designed to hold 10,000 gallons of water, much less than what is expected to be generated prior to SSSTF construction. This storage capacity is based on utilizing well purge water, decontamination water, and ICDF leachate in the stabilization process or disposing it in the ICDF evaporation pond. However, room for expansion of the water storage pad has been included in the design in the event additional water storage is needed.

Alternatives for handling and disposing of grout were also considered. Following treatment of waste, the grout will be staged while quality assurance (QA) verification is performed. Upon verification, the grout would be transported to the ICDF for final disposal.

4. PROCESS AND SYSTEMS DESCRIPTIONS

4.1 Facility and Operational Overview

The SSSTF will be a general purpose ICDF support facility designed to provide centralized receiving, inspection, and treatment necessary to stage, store, and stabilize incoming waste from various INEEL CERCLA remediation sites prior to disposal in the ICDF, or shipment onsite/offsite. The facility will consist of a storage/staging building and associated treatment equipment. Operations at the facility will include chemical and physical treatment to prepare ICDF wastes to meet agency-approved WAC and RCRA LDRs. The SSSTF will operate year round with an operational life of 30 years. The SSSTF will operate 10 hours per day four days per week with an estimated six hours of productive operation per day.

Categories of waste are currently being identified for processing through the SSSTF. These include waste meeting the ICDF WAC and LDRs, waste requiring treatment, and monitoring well purge water. The SSSTF will treat agreed upon inventory—waste meeting the ICDF WAC and LDRs, and destined for disposal in the ICDF without treatment or segregation, will arrive and be processed through the SSSTF weigh station before being allowed access to the ICDF. Waste in this category may arrive in any type of delivery vehicle provided its size and weight do not exceed the capacity of the SSSTF weigh station and the vehicle is capable of unassisted-delivery to the ICDF. All waste loads will be verified and pertinent information entered into the ICDF waste tracking system. Verification will include satisfying QA requirements as detailed in a waste disposal verification plan determined in an EDF.

Waste requiring treatment or segregation, and monitoring well purge water being shipped to the SSSTF will arrive on one of four different types of waste delivery trucks. Solid waste will be shipped in roll-on/roll-off containers (13 cubic yard capacity) or may be prepackaged in drums or plywood boxes (4 × 4 × 8 ft) and transported by means of flatbed and van-body-type semitrucks. Bulk waste may be delivered to the SSSTF by covered dump trucks. Wastewater will arrive in tanker trucks. These vehicles will also be processed through the SSSTF weigh station portal. The SSSTF will be designed to accommodate a given throughput of incoming waste within a six-hour period. The throughput will be determined in an EDF investigating the operational scenario.

After being weighed, inspected, and verified, the trucks containing solid waste destined for treatment or segregation will proceed to a curbed pad large enough to store a three-day supply of waste (30 roll-on/roll-offs or flatbed trailer locations). Storage for solid waste will be limited to waste that requires treatment and is in the current SSSTF treatment campaign. When a campaign is initiated, waste will be delivered from the waste storage pad to a processing building by a truck on an as-needed basis. The processing building will have the provisions for segregating, sizing and treating the waste. Waste in drums or plywood boxes that does not require treatment and meets the ICDF WAC and LDRs will be segregated from waste requiring treatment and shipped to the ICDF for disposal. Segregation is planned to be primarily a manual sorting process with various mechanical handling equipment supplied to support lifting and moving of waste.

After segregation, the waste requiring treatment will undergo sizing and treatment processes. Upon successful treatment, the waste will be ready for shipment to the ICDF. Before exiting the SSSTF, waste will be weighed, verified, and inspected and pertinent information entered into the ICDF waste tracking system. Waste QA procedures will be identified in the Waste Disposal Verification EDF.

A decontamination pad will be located near the exit of the SSSTF for the decontamination of trucks and equipment. Trucks will deliver roll-on/roll-off containers that have been emptied in the process building to the decontamination station, where a high-pressure water sprayer will be used to wash the

containers. After decontamination, the empty containers will be delivered to a curbed staging pad for empty roll-on/roll-off containers, until they are required for further use. If necessary, trucks may also be decontaminated to remove any external radiological contamination prior to exiting the SSSTF battery limits. Any equipment that can not be decontaminated and is no longer in use will be stored in a contaminated equipment storage area. Decontamination wash waters will drain to a sump located in the water storage area. Contents of the sump will be channeled to the appropriate final disposition. Tanker trucks containing wastewater will deliver water to a transfer location equipped with containment. Tankage to store a "to-be-determined" volume of wastewater, including monitoring well purge water, storage pad run-off, wash waters from the stabilization process and decontamination wash waters will be provided. The transfer location area will include a tanker unloading station, transfer pump and storage tanks. Storage pad run-off and wash waters will be collected and drained to an underground sump for temporary storage during sampling to meet the WAC. The solids will be separated prior to transfer. The wastewater will either be used in the stabilization process or will be pumped to the ICDF evaporation pond. Other treatment of the wastewater is not provided.

A storage area will be provided for the accumulation of secondary wastes generated during the course of operating the SSSTF and ICDF. Secondary wastes include treatment process waste, vehicle maintenance waste, ventilation and filtration waste, building maintenance waste, personal protective equipment and construction wastes from additional cells. The secondary waste generated during processing will be stored until it is treated in the SSSTF, disposed in the ICDF, or shipped to an offsite disposal facility.

4.2 Process Description

Waste soil and debris from multiple INEEL CERCLA actions will be treated and/or prepared for disposal by the SSSTF in conjunction with the ICDF. Current INEEL-wide CERCLA waste projections total about 510,000 cubic yards. The waste includes low-level, mixed low-level, hazardous and limited quantities of TSCA wastes. Most of the waste will be contaminated soil, but wood and debris is expected.

The stabilization and treatment function will stabilize, treat, or otherwise prepare INEEL CERCLA waste that does not meet the ICDF WAC for final disposal. Prior to treatment, the incoming waste will be subjected to segregation and sizing operations, including a shredding unit, as deemed necessary by the appropriate treatment processing criteria. Stabilization will be accomplished by grouting the waste.

Treatment equipment and/or technologies for the treatment of RCRA organic concentration-based contaminants will ultimately be designed/constructed to satisfy the ICDF WAC; however as detailed in Section 3, this equipment has not been defined.

Waste will first undergo segregation and, when appropriate, sizing before being treated and/or disposed. Waste-laden roll-on/roll-off containers will be transported from the waste staging pad to the processing building on flatbed semi-trucks. The trucks will be capable of hoisting the containers and dumping the contents onto a feeder. The waste will be fed to a dual auger processor where it will be shredded and pulverized to less than four inches in diameter. This processor will be capable of size reducing plywood boxes and steel drums, as well as soil and concrete. The waste will fall onto a mechanical conveyor after it has been sized and into a surge bin. The surge bin will deposit the sized material into one of several storage bins and moved to a designated storage area within the processing building.

Once the waste has been appropriately sized, it will undergo the appropriate treatment process: grouting, neutralization, or chemical treatment. A truck with hoisting capabilities will dump the sized waste from the storage bins onto a mechanical conveyor where it will be fed to a neutralization station,

chemical treatment station, or batch stabilization plant. If feasible, the same mixing equipment will be used for both neutralization, stabilization, and chemical treatment. The conceptual equipment configuration of the neutralization station and chemical treatment station is not defined at this time.

Stabilization will be performed using a batch plant, capable of stabilizing 130 cubic yards of waste in one day, which will contain the necessary equipment to formulate and mix the grout. Grout ingredients will be delivered in bulk semitrucks for onsite, outdoor storage in silos. The silo storage area will have provisions for storing four different grout ingredients that may include a combination of the following: Portland cement, blast furnace slag, fly ash, clay and sand. Storage capacity of these ingredients will be a minimum of 1.5 times a standard 40,000-lb semitruck delivery, or a one-week supply, whichever is greater. Each of the grout ingredients will be air-conveyed from their storage silos to a day bin and the waste will be fed from a mechanical conveyor. The day bins will be on load cells for accurate ingredient delivery to the mixer. The ingredients will be transferred to a batch hopper and dispensed into a swivel chute, which will distribute the grout ingredients into the mixer. After mixing, the dry ingredients will be combined with the appropriate amounts of water and deposited into forms until QA requirements for disposal have been met. The Waste Disposal Verification EDF will define QA requirements for disposal at the ICDF. The batch plant will be equipped with a wash system so that residual grout may be removed at the end of an operating shift.

5. GENERAL DESIGN AND FACILITY DESCRIPTIONS

5.1 General Design Criteria

To ensure the proper storage, treatment, and maintenance of waste, the design of the new SSSTF shall comply with the requirements of all current recognized codes and standards for design. The occupancy classification has been based on the Uniform Building Code (UBC) and Uniform Fire Code.

The facility layout shall provide for the segregation of administrative and other support personnel from the waste storage and treatment areas. Auxiliary space allotments shall be provided to enhance the overall operations and accommodate the operational efficiency of the personnel. Administrative, office space allowances were based on a man-loading estimate and will comply with Work Space Management Standards.

The layout of storage areas shall provide for the efficient storage and retrieval of soil storage boxes as well as accommodate visual inspection. Design of the facility shall minimize, to the extent possible, the intrusion of inclement weather into the storage areas. Penetrations through the roof will be minimized and sealed tight where necessary.

5.1.1 Health and Safety

The new SSSTF shall be designed to provide health and safety protection in accordance with 29 Code of Federal Regulations (CFR) 1910 "Occupational Safety and Health Standards," National Fire Protection Association (NFPA) 101 "Life Safety Code," and the UBC.

5.1.2 Occupancy Classifications

New construction shall be classified in accordance with UBC Chapter 3, for occupancy classification and UBC Chapter 10, for number of exits, occupancy use, and load factors.

Hazardous Waste storage and treatment areas of the facility shall be categorized as UBC Group H-4 occupancy with Type II-N construction. The supporting areas of the facility (offices, public use, utility areas) shall be Group B occupancy having Type II-N construction.

The SSSTF will have the following UBC area classifications, building type, and square footage requirements:

- Office/Public Use Area: approximately 4,600 sq. ft. total; Group B occupancy; Type II-N construction.
- Storage Area: approximately 8,000 sq. ft. total; Group H-4 occupancy; Type II-N construction.
- Treatment Area: approximately 30,000+ sq. ft. total; Group H-4 occupancy; Type II-N construction.

5.1.3 Contamination Control

Contamination control shall be considered in the design and operations for solid, liquids, and gaseous waste streams. Areas for contamination control shall include but, not be limited to the following:

- As low as reasonably achievable goals
- Tank and vessel off-gas
- Localized and general exhaust
- Air filtration
- Exhaust discharge
- Airchange rates
- Decontaminable materials and surfaces
- Equipment maintenance
- Facility operation.

5.1.4 Fire Resistance

Fire resistance will be provided where required by code. All floors or subfloors will be concrete. The liquids will be stored in self-contained, double-walled, individually heated tanks and will not necessitate insulated, heated space within the building. Required occupancy separation construction will be a one-hour fire assembly.

UBC requirements will be met for exterior wall and opening protection based on location on property.

The nature of the document storage room within the administration building will require one hour fire separation from the rest of the facility.

The mechanical equipment room will have a minimum of one-hour, fire-rated construction due to the need to locate the automatic sprinkler system control valves in the room.

5.1.5 Design for the Disabled Requirements

The administrative areas of the SSSTF will be designed to meet the requirements of the Americans with Disabilities Act (Public Law 101-336), "Accessibility Guidelines," and the UBC.

The hazardous nature of the activities and contents of the storage and treatment areas preclude accommodations for the accessibility of the disabled to these areas.

5.1.6 Energy Conservation

Energy conservation will be considered and designed to meet DOE-ID Architectural Engineering Standards.

5.1.7 Safeguards, Security, and Physical Protection

Controlled access to the facility and to individual areas within the SSSTF will be provided where required.

5.2 Civil

5.2.1 General

The SSSTF will be located adjacent to the INTEC Site at the INEEL. The facility will be sited between the existing substation and the proposed service waste discharge lines to the percolation ponds. Overall facility orientation will facilitate future expansion of the facility to accommodate any future growth that may be required. The site will be developed to allow for sufficient vehicular parking and circulation. Segregation will be maintained between the light vehicle traffic of the administrative/office area and the heavy traffic of the operational activities related to the storage/treatment areas.

Topographic surveying and subsurface investigation of the site will be conducted prior to the title design work. The site will be stripped of existing vegetation, and then filled and graded for the new buildings, access roads, service areas and parking lot. Area to be occupied by the buildings will be raised in relationship to surrounding ground elevations to provide drainage away from the building foundation and entrance sidewalks. Grade changes at the main entrance will be kept to a minimum to permit handicapped personnel and vehicle accessibility. Site surface drainage will be coordinated with existing physical structures and future buildings and planned activities of the surrounding area.

The DOE Natural Phenomenon Hazards Committee is currently evaluating all studies related to the 100-year flood plain elevation. A resolution is pending their decision in the near future. The SSSTF conceptual design will address the impact of the 100-year flood plain. Potential impact to the design of the SSSTF will be evaluated and addressed during the 30% Title I Design .

Existing INTEC water and sewer utilities will be extended to service the new facility. Potable water will be provided for personnel drinking and sanitary uses. Fire water will be provided for the building fire-extinguishing system via a single connection, with provisions for looping the water supply in the future.

Vehicular access will include paved access and service roads, parking area, and staging area to accommodate a protected loading and unloading area. The staging area will be sized for shipping and receiving waste transport vehicles servicing the storage/treatment facility. Adjacent areas not paved but disturbed during construction will be reseeded with native grasses.

5.2.2 Surface Drainage

The topography in the proposed area for the SSSTF is relatively level. Surface drainage will be diverted to the vacant areas surrounding the buildings, providing excellent drainage away from the facility.

5.2.3 Rock Excavation

A geotechnical investigation will be conducted during the title design to determine bedrock elevation, final foundation design, and finish floor grade. Excavation of rock is not anticipated for the installation of underground utilities or for the building foundation.

5.2.4 Soil Excavation and Shoring

The site will be stripped of existing vegetation and graded in all areas where the building, its parking area and access road, and landscaping are to be installed.

Soil excavation will be required for installation of underground utilities and construction of the building foundation. Soil excavation for the foundation will be maintained at a minimum. Required fill material will be supplied by excavation activities of the percolation pond construction preceding construction of the SSSTF. Bedrock is estimated to be well below the excavation depth required for this project.

Shoring and bracing for excavation is not anticipated except where construction is located near the proposed service waste discharge lines to the percolation ponds. Space is available for the backsloping of the majority of all required excavations. Soil compaction will be required to meet 95% maximum density for all embankments, backfill, subgrade, and base courses under building floor slabs and pavement.

5.2.5 Finish Grading and Landscaping

The final finish floor elevation will be determined during title design. It will be established approximately one foot above the existing grade

The feasibility of landscaping areas immediately adjacent to and surrounding the administrative areas should be considered. Landscaping should include lawn and trees to provide erosion and dust control.

5.2.6 Paving

New asphalt concrete access roads will be provided as shown on the site plan for the new facility. Asphalt paving will also be provided to facilitate personnel parking and delivery vehicles.

5.2.7 Slabs, Sidewalks, and Stoops

Reinforced-concrete sidewalks, door stoops, and approaches will be provided to facilitate personnel access to the facility. Provisions for the safe entry to the facility by handicapped will be provided. Guard posts will be provided at the staging area for protection from service vehicle activity. Building utility and equipment slabs will also be reinforced concrete and sized appropriately.

5.2.8 Underground Utilities

The utilities for the SSSTF will be supplied from existing services within INTEC. Coordination will be required between the INTEC landlord, security personnel, and communication personnel when excavation for the utilities occurs within the "no-man's land" security zone and across the perimeter security fence.

Mechanical: A sanitary sewer line will be provided to the SSSTF by tying into the existing INTEC sanitary sewer system. A new 2-inch sanitary sewer line will be routed from the new facility, via a grinder pump, to an existing sanitary sewer manhole.

Potable water will be supplied to the SSSTF by a 4-inch line that will be tied into an existing INTEC 3-inch potable water line. All potable water lines will be buried a minimum depth of 5 feet below grade. The potable water lines will be routed at a minimum of 10 feet from the adjacent sanitary sewer line.

A new 6-inch raw water line will be provided to the SSSTF by tying into the existing INTEC raw water system.

5.3 Architectural

5.3.1 General

The INEEL SSSTF conceptual design will provide space to accommodate all the planned activities, operations, and minimal maintenance requirements of the new facility. In addition to the criteria listed herein, administration and office work space will be provided. Life-cycle, operation, and maintenance costs will be considered in design development. Efficient design features for "life-cycle cost-effectiveness" will include advanced technologies and practices for energy efficiency and conservation, including water preservation and natural daylight illumination, as can be practicably accommodated.

5.3.2 Health and Safety

The new SSSTF will be designed to provide health and safety protection in accordance with 29 CFR 1910 "Occupational Safety and Health Standards," NFPA 101 "Life Safety Code," and the latest edition of the UBC.

5.3.3 Facility Requirements

5.3.3.1 Administrative Office Area. An office area will be sized for approximately 10 employees in hard-wall and partitioned cubicles. Square footages for the cubicles will follow the general services administration standards.

5.3.3.2 Public Use Area. An area will be provided for personnel interfacing with the operational and administrative personnel of this facility. This area will consist of a conference room, to act as a meeting and training room with kitchenette facilities. A training room will be provided to conduct classroom training, serve as a break room and conduct planning functions. An area will also be provided for office machines and supplies.

5.3.3.3 Public/Office Restrooms/Area. Accessible restrooms will be provided. The number of fixtures will meet the minimum required in accordance with the UBC and Uniform Plumbing Code (UPC). A counter with a sink will be provided for coffee pots, microwave space, and for general housekeeping. A small janitors closet with a sink and storage space will be provided.

5.3.3.4 Operational Personnel Areas. Shower, change, and restroom areas will be provided for the operational personnel manning the storage and treatment operations.

5.3.3.5 Utility Rooms. Separate rooms will be provided for the service utility and equipment supporting the facility, such as heating and air conditioning equipment, fire riser, electrical panels, and communication equipment. The individual rooms will be sized as needed to support the equipment required for each utility.

5.3.3.6 Waste Storage Area. An approximately 100 × 120 ft area will be provided to store a limited quantity of the existing boxed contaminated soils as well as purged water. Purged water will be contained in two 5,000 gallon self-contained tanks. The tanks will be double-walled and individually heated. Water controlled from runoffs and decon, will be contained in a similar tank on an outside pad.

5.3.3.7 Treatment Area. A 30,000 + square foot area has been provided for a treatment process, identified to date as a grouting process. It has been assumed that the treatment process will include a sizing process up stream from the grouting.

5.4 Structural

5.4.1 General

The administrative facility and enclosed storage areas will be engineered metal building structures with cast-in-place, concrete foundation, concrete floor slabs. The roof will be standing seam and metal.

The process enclosure will consist of a stressed skin structure over a concrete slab. The concrete floor in the storage and treatment areas will be designed with curb containment and controlled liquid drainage.

5.4.2 Structural Classifications

This facility is not classified as a nuclear facility. With respect to facility use, the SSSTF is classified as a "Low Hazard" facility as defined by DOE-ID Order 5481.1B. The SSSTF facility will have a standard DOE facility design life of 30 years and will be designed in accordance with the *DOE-ID Architectural Engineering Standards*.

With respect to natural phenomena hazards (seismic, wind, and flood), the facility will be categorized as "PC-2" as defined by DOE-STD-1020 and 1021. The *DOE-ID Architectural Engineering Standards* stipulate that the seismic design for a "PC-2" facility be conducted using UBC provisions and procedures.

The facility is located in seismic zone 2B; an importance factor 1.25 will be used. Wind load for the facility will be determined in accordance with the procedures in American Society of Civil Engineers (ASCE) 7-95, using a basic wind speed of 90 mph, an exposure category "C," and an importance factor of 1.15.

Dead and live loads considered in facility design will be in no case less than those stipulated in ASCE 7-95. The minimum snow load for the roof design will be considered as 30 lb/ft², except for additional loading due to drifting.

Facility design will be based on a UBC occupancy classification of Group H, Division 4 for the storage and process areas and Group B for the administrative/office and support areas, electrical, and mechanical rooms. A UBC construction type of II-N will be used for the building.

5.4.3 Footings and Foundations

Building foundations will be reinforced concrete consisting of spread footings and column piers. The floor slabs will be reinforced concrete sized to accommodate vehicular, pedestrian, and equipment loadings as appropriate. It is anticipated that the Administrative/Office floor slab will be 6 in. thick throughout the facility and Storage and Treatment floor slabs will require 8-in. thick floor slabs with 6-in. continuous curbing for containment.

Surface areas where potential for contamination exists shall be prepared for and finished with decontaminable coatings.

5.4.4 Structural Framing System

Structural framing in building areas will be steel columns and beams. Intermediate columns will be used where possible to minimize frame sizes.

5.4.5 Special Structural Features

None identified at this time.

5.5 Mechanical

5.5.1 Heating, Ventilation, and Air-Conditioning

5.5.1.1 Administration Building

Mechanical General

Mechanical systems necessary for operation of the WAG-3 SSSTF Administrative Building include heating, ventilating, and air conditioning (HVAC), and piping and plumbing systems. All mechanical systems will meet the applicable code requirements as listed in Section 6 of this document.

Potable Water and Plumbing

Potable water will be supplied to the Administrative Building by routing a new 4-inch service line from an existing potable water main east of the new facility. Potable water lines will be buried a minimum of 5 ft below grade and be separated from all nonpotable water underground piping systems as required by current code and standards. Underground potable water piping to the building will be polyethylene piping or polyvinyl chloride schedule 80. Underground valve curb boxes will be installed at the service line tie-in point. A back-flow preventer will be installed on the potable water piping system as required by the referenced codes and standards. Interior building plumbing will be copper tubing. The plumbing requirements for the building will include the necessary piping to supply hot and cold water to the rooms listed below:

- Men's shower/restroom
 - Water closet (1)
 - Lavatories (2)
 - Urinals (1)
 - Shower (2)
- Women's shower/restroom
 - Water closet (2)
 - Lavatories (2)
 - Shower (2)
- Janitorial room
 - Utility sink

- Conference room
 - Utility sink (1)
- Miscellaneous:
 - Water cooler (1)

Hot water for the facility will be provided by an electric water heater. The water will have a minimum of 80 gallons water storage capacity. Water heater electric heating elements will be sized to provide 100° F hot water to all showers for a minimum of 1 hour of continuous use.

Sanitary Sewer Systems

The building sanitary sewer system will be a pressure system with grinder pump, which will connect to an existing sewer main line. The new sewer main will be constructed of 2-inch ABA plastic piping. All sewer piping will have all clean-outs required by code.

Heating, Ventilation, and Air-Conditioning

The HVAC system for the administrative building will provide year around comfort for the building occupants. The system design will take advantage of current energy conservation technologies and strategies, which have been successfully used at other DOE facilities.

The buildings HVAC system will consist of multiple, split-system, air-handling units with direct expansion (DX) cooling and electric heat. Mechanical equipment will be located in the building's mechanical room.

Preliminary HVAC equipment sizing for the facility is listed below. The design is based on the installation of two (2) HVAC units serving the building.

- Number of units required—2
- Required cooling capacity/unit—7.5 Tons
- Required Heating capacity/unit—120,000 British thermal units of heat.

Electric heating units will be provided in the building's mechanical room for freeze protection of the fire water system. In addition, electric heaters will be provided in all vestibule entries and locker rooms.

Exhaust air systems will be provided in the facilities restrooms and janitorial areas. In addition, the electrical and mechanical rooms will be ventilated with thermostatically controlled exhaust fans. All entering outside supply air rooms will be filtered.

HVAC control system will be a fully integrated computer-based direct digital control (DDC) system. The system will be fully programmable, and consist of all necessary sensors, actuators, unit controllers and accessories required to operate the mechanical equipment as specified in the final system design. A personal computer (PC) will provide the hardware platform for the system. The facility operator will be able to monitor all HVAC equipment and have the ability to control/change all system set

points and operating schedules. The DDC system will use current computer control technologies commercially available and be fully BACNET- and Y2K-compliant.

An energy conservation report (ECR) normally required by the DOE-ID A/E standards will not be required as part of title design based on the building not exceeding 10,000 sq ft. The new building will however meet or exceed the requirements of 10 CFR 435, "Energy Conservation for Voluntary Performance Standards for New Buildings; Mandatory for Federal Buildings."

5.5.1.2 Enclosed Storage

HVAC: The HVAC for the enclosed storage area will be based on six air changes per hour. This will be provided via a new exhaust fan (for the entire enclosed and liquid storage areas) and an exhaust stack. No heating, cooling, or high-efficiency particulate air (HEPA) filtration will be provided. The UBC H-4 occupancy classification can utilize the existing standby power from the INTEC infrastructure.

Utilities: Raw water and power will be provided to the storage area.

5.5.1.3 Liquid Storage

HVAC: The HVAC for the liquid storage area will be based on six air changes per hour. This will be provided via a new exhaust fan and the exhaust stack noted above (enclosed storage). The self-contained, double-walled liquid storage tanks will have individual heating and will not require a separate heat source within the building. Existing standby power from within the INTEC infrastructure will be utilized.

Utilities: Raw water will be provided from existing services within INTEC.

5.5.1.4 Treatment

HVAC: The HVAC for the liquid storage area will be based on six air changes per hour. This will be provided via a new exhaust fan and an exhaust stack. HEPA filtration will be provided for the treatment area. Heating will be provided to ensure a minimum inside temperature of 40°F. No cooling will be provided.

The UBC, H-4 occupancy classification, does not require emergency power for the exhaust system. Existing standby power from within the INTEC infrastructure will be utilized.

Utilities: Raw water and power will be provided from existing services within INTEC.

5.5.2 Piping and Plumbing Systems

Piping design, materials, and installation will be per the UPC. Floor drains will be installed in all mechanical and fire riser rooms, and in any areas where water could accumulate.

5.6 Fire Protection

5.6.1 Governing Codes and Standards

The fire protection system for the facility will be designed and installed in accordance with the codes, standards, guidelines referenced in Section 6 and the local Authority Having Jurisdiction.

5.6.2 Overhead Ceiling Protection

Automatic sprinkler fire protection will be provided throughout the facility, with sprinkler systems being installed under all building ceilings including above and below any suspended ceiling areas. Sprinkler fire protection systems will be hydraulically designed to meet DOE orders along with NFPA and Factory Mutual Standards. Where building areas are heated, sprinklers are to be wet pipe systems and where there is no heat available, the sprinkler fire protection is to be provided using dry pipe sprinkler systems. The system risers will be hydraulically calculated and will be not less than 6 in. diameter. Underground lead-ins will also be hydraulically calculated and will be not less than 8 in. diameter.

5.6.3 Underground Water Supply and Hydrants

For manual fire fighting efforts, an underground fire main is to be provided around the facility providing each building with adequate hydrants placed for easy access and good fire hose lay down. This underground fire water main will also provide lead-in water supply lines for the buildings overhead fire suppression systems. The underground fire mains will be installed around all buildings and all outdoor work and outdoor storage areas. The underground fire water supply will eventually be a looped water supply at a later date back to the main INTEC plant area using a 12 in. diameter underground pipe. At that time, this will complete a looped well gridded water supply to the buildings.

5.6.4 Fire Extinguishers

Fire extinguishers will be provided throughout the facility using the above standards and guidelines. The types of fire extinguishers used will match the occupancy exposure present.

5.6.5 Exiting

Exits will be arranged in accordance with NFPA 101 "Life Safety Code" and the UBC.

5.6.6 Alarms, Emergency Communication and Egress Exiting

An alarm system and emergency communication system will be installed throughout the facility conforming to NFPA and other applicable DOE and INEEL guidelines. Egress and exits will be arranged in accordance with NFPA 101 "Life Safety Code" and the UBC.

5.6.7 Water Supplies

A 10-inch fire water line will be supplied by connecting to the existing INTEC underground fire water system, inside INTEC, for both automatic sprinklers and fire hydrants.

5.7 Electrical

5.7.1 General

Power for the SSSTF will be supplied from existing Sectionalizing Switches PSS-SFE-1005C and PSS-SFE-1055C. In keeping with the INTEC standard, 500kCMIL 15 kV cables will be run from the Sectionalizing Switches to a new double-ended load center. The cables will terminate in a 15 kV fused switch. A pair of 2,500 kVA, 13.8 kV-480/277 volt transformers will supply power to a load center located outside the facility. New 5-in. duct banks will be installed from the sectionalizing switches to the new load center.

Voice paging and evacuation will tie into the INTEC system in a manhole just east of Chemical Processing Plant (CPP)-603.

Telephone will tie into the INTEC telephone system in the Utility Tunnel to the east of CPP-1635. Access to the Utility Tunnel will be provided via a manhole just south of building CPP-1635. It is anticipated that a 50-pair telephone cable will be provided.

The fire alarm system will tie into the fire alarm cabinet in B21-620, the Substation 2 building.

The fire protection system for the facility will be designed and installed in accordance with the following codes, standards, guidelines, and the local authority having jurisdiction:

The load center will be monitored and controlled by the INTEC utility Control System. This tie in will take place in existing Load Center 4, which is located east of Building CPP-603.

New duct banks will be run to SSSTF from each of these tie in locations.

5.7.2 Power Distribution

The new substation will be centrally located to the north of the Administrative Building. Power will be distributed to the Administrative Building and all other facilities by a 480Y/277 volt, three-phase, four-wire system. Each of the facilities will contain 480Y/277 volt distribution panels, transformers and 208Y/120 volt distribution panels. Electrical rooms or areas dedicated for electrical panels will be provided in each facility. Standby power will be provided via the INTEC standby power system. Control of the standby power will be by the INTEC utility control system; distribution will be via dedicated standby panels conveniently located through the facilities.

5.7.3 Grounding

The substation and each of the facilities will be provided with a ground system. The soil conditions will be analyzed during Title design and a ground system will be designed. Any metal underground piping systems, the rebar in the foundation and the metal frame of the building will be tied to the ground system.

5.7.4 Cathodic Protection

The need for cathodic protection will be analyzed during title design. If necessary, new piping will be tied into the existing cathodic protection system. The design will include any modifications to the existing system made necessary by this project. Any tank systems requiring cathodic protection will follow the guidance of 40 CFR 264.192(a)(3).

5.7.5 Lightning Protection

A lightning risk assessment will be performed in accordance with NFPA 780 during the title design to determine the need for a lightning protection system.

5.7.6 Lighting

Lighting will meet the recommendations of the current Illumination Engineering Society.

Nonglare fluorescent fixtures will supply lighting in the Administrative Building; lighting in the conference room will be supplemented with dimmable lighting. Industrial-type fixtures with metal halide

lamps will be provided in nonoffice areas. High-pressure sodium fixtures will provide exterior lighting in the vicinity the building exits. Metal halide fixtures mounted on poles will provide exterior area lighting. Fixture wattage and pole height will be determined during title design.

5.7.7 Telecommunications

Telephone will tie into the INTEC telephone system in a manhole just south of building CPP-1635. It is anticipated that a 50-pair telephone cable will be provided.

Fire alarm system will tie into the fire alarm cabinet in B21-620, the Substation 2 building.

5.8 Life Safety Systems

Life safety systems will include an addressable fire alarm system and reporting panels. Interface points will be identified during conceptual design.

Emergency communications will be provided by tying into the INTEC system in a manhole just east of CPP-603. A remote distribution module will be required along with the associated speaker and strobes.

6. CODES AND STANDARDS

6.1 Regulatory Requirements

The facility will be designed and constructed in accordance with DOE-ID architectural engineering (AE) standards, which invoke most of the codes and standards required for this facility. Requirements for safety analysis, environmental evaluation and protection, project management, quality assurance, and other activities necessary to support the design and construction of the facility are generally not included in the AE standards.

7. SCHEDULE AND ACQUISITION STRATEGY

7.1 Acquisition Strategy

The procurement acquisition strategy considers the types of actions necessary to acquire services/materials throughout the various project phases. It is anticipated that a combination of lump sum fixed-priced and fixed-rate, ceiling-priced subcontracts will be utilized to procure services and materials from external sources for the construction and design as required. This strategy will be reviewed and updated as necessary to obtain the services/materials in a cost-effective and efficient (best value) manner to optimize the use of internal and external resources

The issue of treatment technology selection and design is not clearly defined at this stage of progress. If adequate in-house design resources are available, all design will be done by the INEEL. However, if in-house resources are not resident, the strategy will be to augment the project team with outside specialty engineering expertise to accommodate the schedule requirement for total design of all processes by the RD/RA scope of work (SOW) enforceable date. A specialty design contract would require close collaboration between different design groups to assure best design streamlining of the processing facility. All design documents will undergo agency review.

All acquisition decisions will be made in concert with INEEL Project Management, INEEL Procurement, and DOE ID.

7.2 Schedule

The project working schedule identified in the RD/RA SOW is applicable to future design activities and subsequent work efforts. There are no changes anticipated to the enforceable or target milestones.

The only significant scheduling issue pertains to the additional chemical treatment technology scope of work and how to assimilate the activities (to be determined) into the final design submission required for the RD/RA Work Plan. At the present time, jeopardy to the schedule cannot be determined.

8. COST ESTIMATE AND FUNDING REQUIREMENTS

The basis of the conceptual estimate for the SSSTF was generated from the block flow diagram, plot plan, general elevations, and the process descriptions included in this report.

Escalation has been included to the midpoint of construction, and a contingency of 30% has been added to all activities to cover changes and additions to the design as it develops.

A summary of the SSSTF conceptual design cost estimate is provided in Table 8-1. A detailed scope of work, basis of estimate, assumptions and the detailed estimate are provided in Appendix C.

Table 8-1. SSSTF cost estimate summary.

Level	Description	Estimate Subtotal	Escalation	Contingency	Contingency %	Total
1000	Construction management	\$860,011	\$76,799	\$187,362	20.00%	\$1,124,172
3000	Title design	\$1,087,890	\$97,149	\$296,260	25.00%	\$1,481,298
4000	Quality assurance	\$230,520	\$20,585	\$50,221	20.00%	\$301,327
5000	Project management	\$648,316	\$57,895	\$141,242	20.00%	\$847,453
6000	Construction AE support	\$526,856	\$47,048	\$114,781	20.00%	\$688,684
9000	Construction	\$14,326,262	\$1,279,335	\$4,681,679	30.00%	\$20,287,276
GAPIF	Non-Org G&A and PIF	\$838,240	\$74,855	\$182,619	20.00%	\$1,095,714
TOTAL SSSTF		\$18,518,094	\$1,653,666	\$5,654,164	28.03%	\$25,830,000

9. REFERENCES

- DOE-ID 1999, *Final Record of Decision. Idaho Nuclear Technology and Engineering Center*, U.S. Department of Energy Idaho Operations Office, DOE/ID-10660, Revision 0. October.
- DOE-ID 2000, *Remedial Design/Remedial Action Scope of Work for Waste Area Group 3, Operable Unit 3-13*, U.S. Department of Energy Idaho Operations Office, DOE/ID-10721, Revision 1. February.
- DOE-ID 1991, *Federal Facility Agreement and Consent Order for the Idaho National Engineering Laboratory*, U.S. Department of Energy Idaho Operations Office, U.S. Environmental Protection Agency Region 10, State of Idaho Department of Health and Welfare.
- DOE-ID 1997, *Comprehensive RI/FS for the Idaho Chemical Processing Plant OU 3-13 at the INEEL*, U.S. Department of Energy Idaho Operations Office, DOE/ID-10534, November.
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